
Summaries

UDC 621.01

Zhukov I.A., Dvornikov L.T.
**MODIFICATION OF DIFFERENTIAL EQUATIONS OF
THE WAVE THEORY OF LONGITUDINAL IMPACT OF RODS**

Modification of Saint-Venant's one-dimensional wave theory at longitudinal impact of rods of complex geometrical forms in view of deformation in the radial direction is shown.

UDC 621.01 (07)

Dvornikov L.T., Popugaev M.G.
**THE PROBLEM OF STRUCTURAL SYNTHESIS
OF SPATIAL ASSUR THREE-LINK MECHANISMS**

The work is devoted to most widely applied in the engineering three-link mechanisms. The original method of structural synthesis of spatial Assur mechanisms is stated. The basis of the theory is complex kinematic circuits defined by complexity of the basic link. Fragments of the full composition of one-link spatial groups of Assur are found and shown.

UDC 539.37

Anfilofyev A.V.
**GEOMETRIC PROPERTIES OF ROD ELASTICITY
IN MODIFICATIONS OF PLANE BENDING
(CONCENTRATED LOAD)**

The elastic rode in the longitudinal bend by concentrated load at greater curvatures is presented as a set of rods of various bend modifications. The general calculation model for research of the effect of load orientation on geometry of elastic curves is formed. It is established, that in some limits the forms of curves are practically independent of the load direction. It allows defining borders with the concept of "smallness" in positions of the traditional bend theory. Properties of the line with linearly changeable curvature are established and its corresponding geometrical representation is given. The diagram of stubble conditions in the range of curvatures from the central compression up to the central stretching is formed.

UDC 621.3.08; 621.3.001.4; 621.3:658.562

Fyodorov E.M., Edlichko A.A.
**CALCULATION OF GEOMETRIC PARAMETERS
OF TWO-COORDINATE MEASURERS
OF DIAMETER OF EXTENSIVE PRODUCTS**

The method of calculation of geometric parameters of measurers of diameter of cable products based on the shadow method of measurement in a divergent laser beam is presented. The opportunity of essential simplification of the calculation process, without an impact on the measurement error of devices, due to the analysis of the each parameter input in calculated resulting diameter, is revealed.

UDC 621.7

Snigirev D.P.
**STRESS CONDITION AT AXIS-SYMMETRICAL
DRAWING OF A COPPER ROD**

The stress condition in plastic area at drawing of a copper rod is investigated by the experimental-analytical method. The presented results can be useful to the experts solving both theoretical and practical problems: quantitative and qualitative pictures of pressure changes are capable to form the basis for reception of theoretical solutions of axis-symmetrical problems in view of the real phenomena

of material hardening. The revealed features of contact pressure change in the field of "Billet-tool" are suitable for solution of practical problems.

UDC 621.833

Yangulov V.S.
**ACCELERATED LIFE-SERVICE TESTS
ON A PRECISION REDUCER**

The results of accelerated life-service tests on a precision reducer are presented. Factors accelerating the process of tests are substantiated. Construction designs of devices for parameter control of transmissions and a stand for an operating time on the resource are shown.

UDC 621.833

Yangulov V.S.
**EXPERIMENTAL RESEARCHES ON INFLUENCE
OF PARAMETERS OF A REDUCER ON DYNAMICS
OF ELECTROMECHANICAL EFFECTOR**

Results of experimental researches on influence of parameters of a reducer on dynamics of electromechanical effector, a part of the system of space vehicle orientation, are presented. Transmissions increasing precision parameters of the device are defined. Construction design of the gearhead of rotation of gimbal frames with a damping device built into its kinematic circuit, providing the demanded accuracy with long life-service, is presented.

UDC 66.028.2

Yefremov E.V., Liventsov S.N.
**ON APPLICATION OF SCREWS IN AUTOMATIC
BATCHERS OF HARD-RUNNING MATERIALS**

The research results of experimental installations, which dose hard-running material with use of screws, are analyzed. The theoretical base is developed for calculation of vertically positioned screws transporting the material down. The analysis of application possibilities of screw batchers for automatic batching of hard-running materials is carried out.

UDC 621.972

Glazov A.N.
**INVESTIGATION OF THE TEMPERATURE FIELD
IN THE NAIL GUN. P. 1. RESEARCH TECHNIQUE
AND WORKING PROCESSES**

The technique and means of temperature field research of hammers is reflected. Laws of working processes in chambers are considered. It is shown, that air temperature in working chambers continuously varies in time and along the way of the hammer, and its maximal and average value is essentially higher than temperatures of compressed air and the environment, except for the part of the cylinder with exhaust windows.

UDC 621.972

Glazov A.N.
**INVESTIGATION OF THE TEMPERATURE
FIELD OF A NAIL GUN.
P. 2. SURFACE TEMPERATURE HISTORY**

Results of an experimental investigation on surface temperature change of a cutting nail gun M-6 in time at cutting in various modes of steel strips and plates, cast-iron plate, are presented.

UDC 621.762

Dureev V.V., Ovechkin B.B., Melnikov A.G.
ENGINEERING AND MANUFACTURING
OF A COMPOSITE METAL-CUTTING TOOL
FOR FREE CUTTING

A composite cutting plate with an insert of a firm alloy with a complex curvilinear surface close to the profile of the zero line of tensions is designed. It allows reducing by up to 70 % the use of expensive tool material without deterioration of operational characteristics.

UDC 674.053:621.935

Shilko V.K., Slepthenko I.V., Kondratyuk A.A.
THE INFLUENCE OF THE BAND SAW WOOD CHIPPER'S
FIXITY CONDITIONS ON THE WOOD SAWING ACCURACY

The article analyses the mobile anchorage with double-sided roller guides fixity conditions of the band saw wood chipper. The roller guides are fettled with flexible elastic elements. The constructive solutions for these guides, making spots on the contact and support reactions on the band saw at the expense of the fettling deformation and frictional forces, are given. The roller guides' work conditions are considered and their parameters are experimentally grounded. The sawing accuracy comparative data are cited for different conditions of the band saw wood chipper mobile anchorage.

UDC 674.815-41

Plotnikov S.M., Pantelev V.I.
THE SYSTEM OF OPTIMUM CHIPPINGS ORIENTATION
OF IN MANUFACTURE OF WOOD PLATES

The structure and description of operation of an automatic control system by an orienting device allowing to maximize the quantity of oriented particles and to minimize their orientation angle are presented.

UDC 521.1

Nagibin G.E.
SOLUTION OF THE PROBLEM ON MOTION OF BODY
IN THE GRAVITATION FIELD IN VIEW OF INERTIA FORCES

The solubility of the problem with use of presentation in the vector form of inertia force, as well as its components - centrifugal and rotary, is shown. On the basis of the expression for Laplace's vector a vector equation is worked out which can be treated as a condition of the directed action of inertia and gravitation forces, resultant of which is equal to the invariable towards the force. It allows us to obtain equations for solution of the problem of undisturbed Keplerian motion, to calculate trajectory parameters and to reduce time dependences of coordinate change in a convenient and relatively simple form.

UDC 621.039.543.6

Shamanin I.V., Gavrilov P.M., Bedenko S.V., Martynov V.V.
NEUTRON-PHYSICAL ASPECTS OF THE PROBLEM
OF HANDLING IRRADIATED NUCLEAR FUEL
WITH INCREASED BURNUP FRACTION

The main sources of neutron radiation of the irradiated nuclear fuel are considered. It is found, that at increased burnup fraction of nuclear fuel and its aging from three years and more the main neutron radiator is ²⁴⁴Cm, and contribution of (α , n)-reaction to the common neutron activity is caused by presence and quantity of isotopes Pu, Am and Cm. Parameters of radiation environment near the transport container of a serial design with placed inside standard irradiated fuel assemblies and assemblies on the basis of UO₂ and PuO₂ are evaluated. It is found, that efficiency of protection of a transport container essentially decreases with increase in depth of burnup fraction of the assembly.

UDC 537.333

Grigoryev V.P., Vagin E.S., Ofitserov V.V.
MODELING OF A DOUBLE ELECTRIC LAYER IN A DIODE,
FILLED BY PLASMA OF INERT GASES

Modeling of a double electric layer formation in the diode filled by gel or argon plasma with low density is examined. The description of the numerical model developed in Matlab environment is given. The results of modeling of the double layer parameters and intensity of an

electric field on the cathode are cited. The effect of various plasma parameters and an accelerating voltage on the process of double layer formation and potential distribution is defined.

UDC 533.92

Grigoryev V.P., Koval T.V., Rakhmatullin R.R.
SELF-CONSISTENT STATIONARY CONDITION
OF AN ELECTRON FLOW IN COAXIAL REFLECTING TRIODES

Stationary condition of an electron flow and formation of virtual cathode in coaxial reflecting triode in a wide range of accelerating voltages is considered. Dependence of linear density of an electronic current and a radius of virtual cathode formation on voltage, diode geometry and anode grid transparency for systems with convergent and divergent beam is investigated. The analysis and comparison of parameters of such coaxial systems is carried out.

UDC 535.36

Goryachev B.V., Mogilnitskiy S.B.
TRANSFER OF OPTICAL RADIATION IN CONDITIONS
OF SCATTERED CLOUDS

The effect of cloudiness parameters on radiating balance of the atmosphere is investigated. It is established, that the greatest contribution into the albedo of a cloudy atmosphere is made by clouds with the maximal degree of symmetry. The principle of invariance for scattering media of unlimited cross-section optical sizes on the case of spatially limited disperse medium is generalized. The dependence of radiating balance of a cloudy atmosphere on optical sizes of clouds at a constant point of cloudiness is defined; the parameter describing cloudiness fragmentation is introduced.

UDC 533.9.082.5

Petrakov A.V., Scherbakov A.P.
REGULARIZATION AND RESTRICTION OF THE SOLUTION
REGION IN INVERSE PROBLEMS OF VIBRATION-ROTATION
SPECTROSCOPY

The approach to the problem solution of adjustment of Hamiltonian of molecule of the asymmetrical spinner type, based on application of regularization method, is examined. Unlike earlier known approaches, special methods were applied for stability of the solution process and for restriction of the solution area. Restriction of the solution region provides the solution with a physical sense.

UDC 539.194:535.621

Bykov A.D., Yemelyanov D.S., Stroynova V.N.
THE MODEL OF RELAXATION PARAMETERS
OF SPECTRAL LINES OF TWO-NUCLEAR MOLECULES
AT STRONG OSCILLATORY EXCITATION

The theoretical model is presented, allowing receiving calculation values of a half-width and shift of line centers in two-nuclear molecules for spectral databases and laser physics. Reliability of the model is confirmed by comparison with experimental data for lines of a strip 0-3 of CO molecule. Good predictive ability of the model for transitions to high oscillatory conditions is shown.

UDC 531.355

Panchenko A.Yu., Shilko E.V., Astafurov S.V.,
Korostelev S.Yu., Psakhie S.G.
DEVELOPMENT OF PARTICLE METHOD DESCRIPTION
FOR CALCULATION OF CONDITIONS
ON THE SOLID-LIQUID INTERFACE

Base description of boundary conditions, allowing effectively carrying out account of «mechanical» effect of a liquid, is offered for numerical modeling by the particle method of behavior of solid bodies in a liquid medium. In spite of a number of restrictions, the developed algorithm of implementation of conditions on the boundary solid-liquid has shown applicability for solution of a wide range of problems connected, in particular, with studying of behavior of various sheet media (ice covers of reservoirs, lithosphere fragments, etc.), rested on a liq-

uid-like foundation. Thus, the simplicity and efficiency of the offered approach gives way to realization of boundary conditions of the given type within the limits of various particle methods attributed to the class of methods of discrete elements.

UDC 621.315.3

Merkulov V.I., Pochivalova A.V.
DISCHARGE FEATURES ON SOLID LAYERED DIELECTRIC INTERFACE

The relationship between the value of discharge voltage on solid layered dielectric interface and the length of discharge condition is established. The phenomenon of embedding of the discharge channel in dielectric, adjoining to the interface border, its output on the external surface with the subsequent development by air is revealed.

UDC 537.521.7:621.315.6

Tkachenko S.N., Gefle O.S., Lebedev S.M.
THE FIELD DEPENDENCY OF COMPLEX PERMITTIVITY OF PE FILLED WITH LEAD ZIRCONATE TITANATE

Results of the study of field dependency of complex permittivity of filled composites on the basis of PE are presented in this paper. The relationship $\varepsilon^* = f(\varepsilon)$ can be approximated by two functions: linear and semicircle. It was found that the relation between the complex permittivity and the external electric field allows the estimation of the dielectric strength of composites to be performed.

UDC 535.215.12

Karimov B.H.
PHOTOVOLTAICEFFECT IN PYRO- AND PIEZOELECTRIC CRYSTALS

Photovoltaic effect in pyro- and piezoelectric crystals is discovered and investigated. Photovoltaic factors K_{ij} for pyroelectric crystals ZnO and cubic crystals ZnS are defined. Values $K_{31} = 2 \cdot 10^{-10}$ A·cm·(Wt)⁻¹, $K_{33} = 2 \cdot 10^{-9}$ A·cm·(Wt)⁻¹ at $\lambda = 460$ nm and $K_{31} = 1 \cdot 10^{-10}$ A·cm·(Wt)⁻¹, $K_{33} = 3 \cdot 10^{-10}$ A·cm·(Wt)⁻¹ at $\lambda = 600$ nm for ZnO, and photovoltaic factor $= 2 \cdot 10^{-9}$ A·cm·(Wt)⁻¹ for cubic crystals ZnS are defined.

UDC 533.9

Yanovskiy V.P., Lukanin A.A.
INSTALLATION FOR STUDYING PASCHE'S LAW

Installation for studying Pashen's law at change of pressure, distance between electrodes and test pressure in ranges of $10^5 \dots 1$ Pa, 0...25 mm and 0...30 kW accordingly, is described. Measurement results of the dependence $U = f(p \cdot d)$ for air are revealed.

UDC 539.16.04:669.295:539.382

Nikitenkov N.N., Kudryavtseva E.N., Chernov I.P., Tyurin Yu.I., Grabovetskaya G.P., Melnikova E.N.
HYDROGEN SATURATION EFFECT AND IRRADIATION BY IONIZING RADIATION ON STRUCTURE AND MECHANICAL PROPERTIES OF SUBMICROCRYSTALLINE ALLOY Ti-6Al-4V

Researches of hydrogen saturation effect on deformation behavior and mechanical properties of biphasic titanic alloys in submicro-

crystalline condition in the interval of temperatures 773...1023 K have been carried out on the example of titanic alloy Ti-6Al-4V (VT-6). The influence of electron irradiation modes on the output of hydrogen from submicrocrystalline alloy Ti-6Al-4V and stability of its submicrocrystalline structure are studied. It is shown, that saturation of submicrocrystalline alloy Ti-6Al-4V by hydrogen up to 0,24 mas. % at temperatures above 773 K leads to increase in its strength and fluidity by 2...3 times and to decrease in size of deformation to destruction by 1,5...2 times. It is established, that at an irradiation by an electron stream with increase in a current density from 3 up to 30 mA·cm⁻² the intensity of hydrogen output superlinearly increases up to 20 times, and at current density of 25...30 mA·cm⁻² the heating of the sample by a beam reaches temperatures (more than 673 K), leading to significant recrystallization of submicrocrystalline condition.

UDC 621.785:669.14.08.29

Ivanov Yu.F., Kolubayeva Yu.A., Grigoryev S.V., Ovcharenko V.E., Koval N.N.
NANOSTRUCTURING OF FIRM ALLOY TiC-NiCrAl SURFACES BY ELECTRON-BEAM PROCESSING

Pulse electron-beam processing and investigation of phase composition and defect substructure of metal-ceramic alloy surface of the compound TiC-NiCrAl are carried out.

The laws are revealed; evolution mechanisms of phase composition and defect substructure of crystallites of titanium carbide and a binding material, as well as controlling operational characteristics of metal-ceramics, are uncovered.

UDC 621.785:669.14.08.29

Ovcharenko V.E., Ivanov Yu.F.
TRIBOLOGICAL PROPERTIES OF NANOSTRUCTURED SURFACE OF A CERAMIC-METAL ALLOY ON THE BASIS OF TITANIUM CARBIDE

The research results of dependences of cutting depth by a diamond counterbody, areas of cross-section of a surface cutting groove of ceramic-metal alloy TiC-(Ni-Cr) and friction coefficient on the surface of ceramic-metal alloy on the character of nanostructured modification of a surface layer of the alloy at pulse electron-beam irradiation of its surface are cited. It is shown, that nanostructuring of metal binding agent in a surface layer of ceramic-metal alloy reduces friction coefficient on its surface.

UDC 621.791.75.037

Chinakhov D.A., Skakov M.K., Gradoboev A.V., Uvaliev B.K., Sharov V.V.
CHANGE OF MICROSTRUCTURE AND MECHANICAL PROPERTIES OF MULTILAYERED CONNECTIONS FROM STEEL 30XГСА AT FUSION WELDING USING DIFFERENT METHODS

The problem of welding alloyed steel in a slotted cutting is examined. The research results of microstructure and mechanical properties of multilayered welded connections from steel 30XГСА, executed by the traditional and developed way of welding, are described. It is established, that the developed way of welding provides reliable weld quality with improved microstructure and increase in mechanical properties of welded connections with a slotted cutting.